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Ecological behaviour in the AI economy and its impact on biodiversity: Lessons from the COVID-19 pandemic and a post-COVID perspective

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Introduction

The problem of biodiversity conservation is formulated by the UN Sustainable Development Goals (SDGs): SDG 14 (conservation of marine ecosystems) and SDG 15 (conservation of terrestrial ecosystems) (Mehmood et al., 2022; Sobieraj et al., 2022; Wang et al., 2022). The relevance of this problem is particularly high at present against the background of the global increase in the number of zoonotic diseases, as well as against the background of the COVID-19 pandemic, which, according to many scientists (Khetan, 2020; Codeço et al., 2021; Fernández et al., 2021; Lawler et al., 2021; Morand and Lajaunie, 2021; Tsantopoulos et al., 2021), is a new zoonotic disease directly or indirectly caused by the destruction of the natural habitat of animals and the unsafe neighbourhood of people with them.

In the existing literature, Dick et al. (2022), McLaughlin et al. (2022), Xie et al. (2022), the reduction of biodiversity is interpreted as an environmental problem. The main attention is paid to natural and climatic threats to biodiversity. In their works, Marques et al. (2019), Meng et al. (2019), Otero et al. (2020), and Usman Mirza et al. (2020) also point to the significant role of economic factors of biodiversity, the reduction of which is perceived as the environmental costs of economic growth. At the same time, the role of social factors is insufficiently developed and not defined, which is a research gap.

In this article, the study is based on the Noospheric model of economic systems, according to which these systems are considered as a unity of all constituent elements aiming at a balance of economic, social and environmental development. However, the role of social factors is not elaborated sufficiently nor determined in developing countries, which is a research gap. It is important to take into account the modern high-tech context of society's development. The transition to an AI economy in the works of Alvarez Leon (2021), Buhvald et al. (2021), Popkova et al. (2020) and Popkova (2022) is associated with the formation of a technogenic (information) society in which knowledge and technology are the driving forces.

In this regard, the economy is perceived as a socio-economic environment that is separated from environmental problems and, in particular, unfavourable for solving the problem of biodiversity conservation, since it contradicts the interests of accelerating high-tech economic growth. Nevertheless, the connection of the AI economy with biodiversity has remained largely unexplored, which is another research gap filled in this article.

This article aims to explore a change in ecological behaviour in the AI economy and biodiversity against the background of the COVID-19 pandemic, as well as to determine the post-COVID perspective of biodiversity conservation through improving ecological behaviour in the AI economy.

The originality of this paper consists in its elaborating on the little-studied experience of developing countries in the sphere of the change of ecological behaviour amid the COVID-19 pandemic by the example of Russia and describing its consequences for biodiversity and the post-COVID perspective in the AI economy. The paper's contribution to the literature consists in strengthening the evidential base of the hypothesis on the popularisation of responsible ecological behaviour in the AI economy under the conditions of the COVID-19 pandemic, supplementing the extensively researched experience of developed countries with insufficiently researched in the literature the experience of developing countries, by the example of Russia.

Literature review

The important role of ecological behaviour in the preservation of biodiversity has been studied in detail and described in multiple works by Chaigneau and Schill (2022), Deng et al. (2016), Luengo-Valderrey et al. (2022), Sullivan et al. (2017), Tang et al. (2022) and Toppi et al. (2016). The specifics of ecological behaviour under the conditions of the AI economy are described in the works of Ligozat et al. (2022), Nost and Colven (2022), Sarmento and Loureiro (2021), Skiter et al. (2022) and Yankovskaya et al. (2022).

Content analysis of the above literature demonstrated that these specific features are contradictory. On the one hand, smart technologies of the AI economy provide new opportunities for environmental protection and, in particular, the preservation of biodiversity. On the other hand, the dissemination of smart technologies in the AI economy leads to new ecological risks, i.e., an increase in the economy's energy intensity. Aubry et al. (2021), Guo and Lee (2022), Li et al. (2021), Naseer et al. (2022) and Tagliacozzo et al. (2021) provide many proofs from developed countries and propose a hypothesis on the increase in the level of ecological responsibility of population and business amid the COVID-19 pandemic.

While the main attention in these publications is focused on the leading experience of developed countries, the experience of developing countries remains poorly studied, the same as the role of smart technologies in the AI economy. Thus, there remains uncertainty as to whether the proposed hypothesis can be used for developing countries. This is a literature gap.

This allows formulating the research question (RQ) of this paper. RQ: How did the ecological behaviour of developing countries change under the conditions of the COVID-19 pandemic and what are its consequences for biodiversity and the post-COVID perspective in the AI economy? In this paper, the research is performed based on the model of 3Ps of sustainability (3 principles of sustainability & sustainable development), according to which these systems are considered in their unity, striving toward the balance of the economic, social and ecological development. This allows filling the discovered gap and studying the connection between social factors (ecological behaviour) and biodiversity.

Materials and methods

This research is performed in two consecutive stages. The first stage includes the determination of the lessons of the COVID-19 pandemic for ecological behaviour and biodiversity. The research is performed based on the 3P sustainability model: people, profit and planet. For this, the method of case study is used for an overview of the leading experience of Russia in the sphere of the use of ecological behaviour of population and business amid the COVID-19 pandemic. The information and empirical materials of RBC (2022) are used.

To reveal how the COVID-19 pandemic influenced ecological behaviour and biodiversity, we use the method of trend analysis. As the indicator of ecological behaviour, we use social inclusion according to Global Green Growth Institute (2022). As the indicators of protection of ecosystems and preservation of biodiversity, we use Goal 14 Score and Goal 15 Score according to the UNDP (2022). The growth of these indicators over 2019–2021 is assessed.

The second stage implies the determination of the post-COVID perspective of improving the ecological behaviour in the AI economy to preserve biodiversity. We propose recommendations for the fullest development of the potential of the preservation of biodiversity in the post-COVID period and perform an overview of the prospects for improving ecological behaviour based on the leading technologies of the AI economy.

Lessons of the COVID-19 pandemic for ecological behaviour and biodiversity: An overview of the leading experience of Russia

To determine the lessons of the COVID-19 pandemic for ecological behaviour and biodiversity, let us perform an overview

of the leading experience of Russia based on the 3P sustainability model: people, profit and planet.

P1: People. RBC (2022) notes the growth of the popularity of green technologies and ESG initiatives in Russia amid the COVID-19 pandemic. Based on the "Zero waste" project of Greenpeace in Russia, Procter & Gamble performed a representative study of buyer preferences. It demonstrated a large interest of the Russians in the "green agenda." The survey's results showed that 90% of Russians are ready to sort household garbage, and 69% are ready to pay the extra price for eco-products. Also, 55% of the respondents express interest in the ecological standards of manufacturers before purchasing their products.

P2: Profit. From the position of the government, there are government programmes for the development of the green economy in Russia. One of the programmes envisages the expanded responsibility of manufacturers–the use of the mechanisms of economic regulation, according to which the manufacturer and importer of goods have to dispose of the manufactured or imported products at the end of their life cycle, after their losing consumer properties. There is also a national project "Ecology," which is aimed at the effective treatment of production and consumption waste. Another important program is the one that supports projects on the construction of infrastructure for waste treatment in Russia's regions.

The government's initiatives are actively supported by business, which implements multiple ESG initiatives. The Russian branch of Danone declares ideas and implements the principles of packaging eco production and control. By 2019–2020, the company's share of recycled plastic in the production of packaging reached 25%.

Rockwool factory in Vyborg, which manufactures heat-insulating materials that are used in construction, works in the regime of the circular economy. In 2020, the company started working on the project of return of façade and roof heat-insulating boards from the construction sites of St. Petersburg and the Leningrad Region, according to the "Vtoraya Zhizn" ("Second life") project. State concern Galaktika (dairy products) implements a dairy organic campaign on the production of the environmentally friendly product in organic packaging.

Rosseti Lenenergo PJSC implements a program of creation of a network of electric charging stations, which will allow using more electric cars. Sberbank offers green crediting: the transition from physical carriers to a digital card in 2020 alone allowed saving more than 1.3 tons of plastic in the North-Western Federal District of Russia. In Murmansk Region, Sberbank supports the campaign "Clean Arctic" in the implementation of environmental projects on the replacement of equipment at polluting companies in the region.

P3: Planet. Trend analysis allowed revealing that social inclusivity in Russian society grew by 3.16% in 2020 (77.88 points) compared to 2019 (73.36 points) (Global Green Growth Institute, 2022). This provided serious results for the preservation of biodiversity. Despite the modest result by the Goal 15 Score (-0.04%), the Goal 14 Score grew by 23.14% in 2021 (52.3205 points) compared to 2019 (42.4900 points) (UNDP, 2022).

The results that were obtained by the example of Russia demonstrate a large value of ecological behaviour for the preservation of biodiversity in developing countries. We also revealed a substantial potential for the preservation of biodiversity through the improvement of ecological behaviour in developing countries, by the example of Russia.

The post-COVID perspective of improving ecological behaviour in the AI economy for biodiversity conservation

To determine the prospects for unlocking the potential of biodiversity conservation in the post-COVID period, we will consider the prospects for improving ecological behaviour based on advanced technologies of the AI economy:

- Artificial intelligence (AI) can provide intelligent decision support in the field of biodiversity conservation. This will allow finding flexible solutions for the development of urban and rural areas with minimal damage to biodiversity;
- Ubiquitous computing (UC) will allow to track the number and habitats of animals and, based on this, conduct continuous monitoring of biodiversity;
- Big data will make it possible to study biodiversity trends and select the most effective practices of ecological behaviour for the conservation of biodiversity;
- Machine vision will enable us to identify practices of ecological behaviour that are prohibited and negatively affect biodiversity and to stop them in a timely manner.

The implementation of the mentioned prospects for improving ecological behaviour in the AI economy will serve the interests of biodiversity conservation to prevent future epidemics and pandemics.

Discussion

The paper's contribution to literature consists in strengthening the evidential base of the existing hypothesis in developing countries–specifying the role of ecological behaviour in the AI economy in the preservation of biodiversity by the example of Russia, amid the COVID-19 pandemic. The results showed that biodiversity is determined not only by natural and climatic factors [unlike Dick et al. (2022), McLaughlin et al.

(2022), Xie et al. (2022)] and not only by economic factors [unlike Marques et al. (2019), Meng et al. (2019), Otero et al. (2020), Usman Mirza et al. (2020)] but also by social factors. Ecological behaviour is a significant social factor that largely determines success in preserving biodiversity.

It is also shown that, unlike Alvarez Leon (2021), Buhvald et al. (2021), Popkova et al. (2020), and Popkova (2022), the AI economy is not exclusively a technogenic environment. Based on the Noospheric model of economic systems, it has been established that favourable opportunities have been created in the AI economy for the use of "smart" technologies to adjust ecological behaviour in order to preserve biodiversity. This enabled us to take a fresh look at the AI economy as an economic system with a balance of economic, social and environmental development.

Conclusion

The experience of developing countries (by the example of Russia) was taken into account, and the lessons of the COVID-19 pandemic for ecological behaviour and biodiversity were revealed. By the example of Russia's experience in the 3P sustainability model, we substantiated a large role of ecological behaviour in the preservation of biodiversity amid the COVID-19 pandemic. We also revealed a substantial potential for the preservation of biodiversity through the improvement of ecological behaviour in the post-COVID perspective, based on smart technologies of the AI economy.

The theoretical significance of the results obtained is that the key role of social factors (ecological behaviour) in the conservation of biodiversity is justified, as well as the close relationship of the AI economy with biodiversity. The practical significance of the conclusions is that they allow accelerating progress in the practical implementation of SDG 14 and SDG 15 through improving ecological behaviour in the AI economy based on the proposed recommendations.

Speaking about the limitations of this study, it should be noted that it focuses on COVID-19 and the post-pandemic period, which determines the linkage of the results obtained to this particular time period. In future scientific papers, it is advisable to expand the time frame of research and study the overall contribution of ecological behaviour in the AI economy to the conservation of biodiversity.

Author contributions

EP, TL, AK, and YP contributed to conception and design of the study. TL wrote the first draft of the manuscript. EP, AK, and YP wrote sections of the manuscript. EP prepared the final version. All authors contributed to manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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